INFORMATION SYSTEM DEVELOPMENT WITH SUPPLY CHAIN MANAGEMENT APPROACH IN KURNIA SARI BAKERY

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ABSTRACT

Kurnia Sary Bakery is a manufacturing company engaged in the culinary field (Bread), Kurnia Sari Bakery sells two kinds of sweet bakery products, namely bread and Bread. Sweet bread includes: bread Moka, Kopyor, mattress, rolls, milk, Sobek, Odading, Curo.Roti Fresh namely: Bread and large white bread. The problems that occurred in the company Kurnia Sari Bakery is often deficient or excess raw materials in the warehouse of raw materials and memaksimalkankendaraan. Based on the problems that exist today in Kurnia Sari Bakery, hence the need for an information system development approach to supply chain management. The development objective of this information system is to facilitate the head of the warehouse of raw materials to determine the amount of raw materials to be ordered and facilitate the delivery of parts to maximize the chief vehicle of the transaction is erratic. Supply Chain strategy used is Push SUUPLY Chain, because according to the activity in the company that is using a strategy of make-to-stock. Forecasting methods used is the product ordering Single Exponetial Smoothing method and security method supplies products and raw materials are methods Safety Stock.

Keywords: *Supply Chain Management, Safety Stock, Single Exponential Smoothing, Make-to-stock, Push Supply Chain.*

1. INTRODUCTION

Kurnia Sary Bakery is a manufacturing company engaged in the culinary field (Bread), Kurnia Sari Bakery sells two kinds of sweet bakery products, namely bread and Bread. Sweet bread includes: bread Moka, Kopyor, mattress, rolls, milk, Sobek, Odading, Curo.Roti Fresh namely: Bread and large white bread. Manufacture Bread and BreadSweet dilakukkan different place. Kurnia Sari Bakery has three storage facilities are: storage of raw materials, storage and warehouse products bakery products stale bread. The production process and raw material purchases in Kurnia Sari Bakery uses a strategy make-to-stock, namely the purchase of raw materials and the production process prior to booking. The company carries out the production process in a large (Mass Product) to anticipate the subscription of bread products by the Agent. Kurnia Sari Bakery has supply chain management activities from the upstream to downstream. the upstream conducted by Kurnia Sari Bakery is the process of ordering raw materials to suppliers, receiving raw materials and to process raw materials into products Bread. Kurnia Sari Bakery has 5 categories of suppliers of raw materials including wheat supplier, suppliers of sugar, butter supplier, supplier Medicine bread and plastic supplier. Purchases of raw materials in Kurnia Sari Bakery made on credit and cash. Downstream activities is the delivery of finished products to agents, in Kurnia Sari Bakery has three types of agents are distributors, markets and shops. Most products on Kurnia Sari Bakery usually dilakukkan via telephone to market agents, distributors danToko usually pass up the booking directly to the factory.

Based on data obtained Kurnia Sari Bakery has a number of product sales from the month of July to December 2017 as many as 1,327,767 Bread with highest number of sales is Kopyor bread product with sales reaching 537 725. Based on the facts obtained at the time of the booking period every month erratic resulting in raw material storage section chief difficulties in determining the amount of raw materials to be ordered to the supplier for the next month. It becomes a problem when ordering bread menigkat shortages of raw materials in warehouses as in December 2017 when raw materials are 632 sacks of flour required whereas in December was 636.5 zak bula wheat, which resulted in the production process does not go smoothly.1920 packs of bread, and the amount of bread that is returned by the agent in stale condition seen in September 2017 as many as 10 677 packs of bread which resulted into a decline in corporate profits [Appendix 1].

Based on the interview with the head of the shipping department [Appendix 2] The company Kurnia Sari Bakery stated that from the procurement of raw materials every month erratic and orders each agency uncertain result in any orders that were not fulfilled and the delivery had to wait for the product to stock products bakery warehouse bakery products are met. Vehicles in sari Kurnia bakery is not used to the maximum for their vehicles that are not used and should be treated as vehicles used for the delivery of

bread to each agent resulted in expenses for car use and which are not used together.

Based on the background of the problem, we need a development information system *supply chain management* that the management of the flow of raw materials or products and the flow of information in the company from the start ordering raw materials, raw material processing and product delivery process to the agent in sync.

Based on the background of the problems that have been submitted, the problems that occur in Kurnia Sari Bakery is how to build information systems approach to Supply Chain Management in Kurnia Sari Bakery.

Based on the problems studied, the purpose of this study was to establish the Information System Supply chain management approach in the Company Kurnia Sari Bakery.

While the objectives of development Supply chain management information system are:

1. Facilitate Head of the Warehouse Raw to determine the amount of raw materials to be ordered.
2. Head facilitate delivery section of the vehicle to maximize the transaction is erratic.

2. CONTENTS RESEARCH

2.1 Theoretical Basis

The theoretical basis of this thesis will explain the theories related to Supply Chain Management Information System in Kurnia Sari Bakery.

2.1.1 System

The system is a collection of elements that interact to achieve a particular goal [1].

2.1.2 *Supply Chain Management* (SCM)

supply Chain (Supply chain) is a system where an organization distributing goods production and services to its customers. This chain is also a network or networks of interconnected organizations that have the same goal, which is the best possible conducting procurement or distribution of the goods. [3].

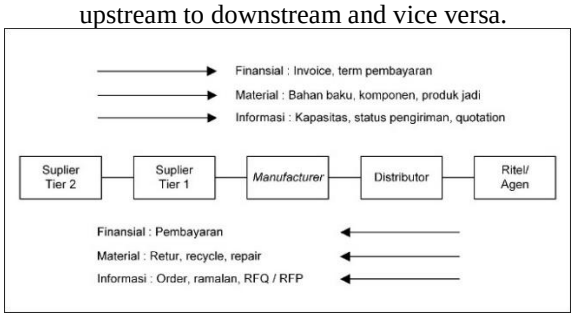
2.1.3 Component Supply Chain Management

Supply Chain Management has three components, some of which are Upstream Supply Chain Management is a process where companies get suppliers from outside to obtain raw materials. Then the second component is the Internal Supply ChainManagement is a process where a change of raw materials into a finished product. The final component of SCM is Downstream Supply Chain Managament is a process where the distribution of goods by the company to the customer which is usually carried out by external distributors [5].

2.1.4 Process Supply Chain Management

In the supply chain there are usually three kinds of streams that must be managed. Three kinds of streams that must be managed pad supply chain is as follows:

1. The flow of goods flowing from upstream to downstream.
2. The flow of money and the like flowing from downstream to upstream.
3. The flow of information flowing from upstream to downstream and vice versa.



Picture 1. Simplification model of supply and 3 kinds of managed flow [4].

2.1.5 *push* and Pull Supply Chain

Existing approaches in Supply Chain Management is composed of a push-pull supply chain and supply chain. Here is an explanation of pull and push supply chain in Supply Chain Management (SCM): [6]

Pull supply chain is a production strategy of "make-to-order" the main benefit is to avoid waste inventory or a company mainly manufacturing strategy in which new production is done always after the market demand and actually performed at the request of customers, while *Push Supply Chain*is a production strategy Make-to-Stock. This strategy is the opposite of the Pull strategy where the appeal pull, push the strategy more popular due to the system of production based forecasting and produce large amounts of output that will be entered into inventory before it is piped to customers.

2.1.6 Procurement

Procurement is one of the main components of supply chain management. The task of procurement is to provide input, in the form of goods or services, which are required in the production activities and other activities within the company. In manufacturing companies, Brang which must be purchased by the procurement section can be generally classified into (i). Raw materials and components for production needs, (ii). Capital equipment such as machinery and equipment Other long term, and (iii). Machine parts, office equipment and so on are usually called maintenance, repair, and operating (MRO) supplies [4].

2.1.7 Inventory

Inventories along the supply chain have major implications for the financial performance of a company. The amount of money that is embedded in inventory are usually very large so that the inventory is one of the largest asset owned supply chain. Many companies that have a value persediaanya melibihi 25% of the overall value of assets owned. This means that the cost of capital retained in the form of stock in a company / supply chain is huge. [4]

2.1.8 Mechanical Safety Stock

Based on the classification of inventory described earlier authors use the technique Safety stock to mngakomodasi demand uncertainty affecting the supply [4].

Safety stock (safety stock) are useful to prevent shortages of raw materials at a certain moment or during the grace period (lead time) in the subsequent booking process, supply security (safety stock) are useful to protect the company from the risk of running out [3].

Formulas safety stock (SS) to find the value of safety stock can be seen in equation 2.1.

Safety Stock = Z x Sdl (2.1)

Where:

Z = Service Level (A company's ability to service requests or translated from management decisions)

Sdl = determined by the provisions of demand uncertainty can be seen in Figure 2.

variabel	konstan	variabel
Permintaan	Sdl = Sd x $\sqrt{(l)}$ *Safety Stock* ditentukan oleh ketidakpastian permintaan.	Sdl = $\sqrt{(d^2 \times Si^2 + l \times sd^2}$ *Safety Stock* ditentukan oleh interaksi dua ketidakpastian.
konstan	Tidak diperlukan *safety stock*, situasi deterministik (S_{dl} = 0).	Sdl = d x sd *Safety Stock* ditentukan oleh ketidakpastian *lead time*.

Lead Time

Picture 2. The interaction between demand and lead time on the determination of safety stock

2.1.9 Forcesting

The theory is used to forecast demand forecasting which will be used as a benchmark in the planning of production activities. Demand forecasting is an activity to estimate the magnitude of the demand for certain goods or services in a particular period and marketing area.

Forecasting (forecasting) is predictive values of a variable based on the known value of the variable or variables related. Predict can also be based on skills assessment, which is in turn based on historical data and experience [7].

2.1.10 Single Exponential Smoothing Methods

Data patterns of unstable or turbulent changes are large and generally using exponential smoothing models (Exponential Smoothing Models). Single Exponential Smoothing method is more suitable for predicting fluctuations things randomly (irregularly).

Forecasting is based on exponential smoothing method (exponential smoothing) is generally used to estimate sales of individual products. This method is often considered to be better than the two previous methods are simple averages and a single moving average because of its ability to use past data by assigning weights based on contemporary data. More data are now given greater weight than the previous data. The assumption is that the data is now always have a stronger effect on forecasting results are compared with data more outdated [8]. The formula for single exponential smoothing can be seen in equation 2.2.

$$F_{t+1} = aX_t + (1 - a\ )F_t \quad (2.2)$$

Information :

F_{t+1} = Results *forecast* for period t-1
a = Constant smoothing
X_t = Data *demand* Actual for period t
F_t = Forecast in period t

2.1.11 Measurement Errors Forecasting

Measuring error (Error) Forecast Error (MAE) and Mean Absolute Error (MAE) is the average absolute error of errors to predict, regardless of the positive or negative sign [10].

1. ***Mean Absolute Error (MAE)***
   Mean Absolute Error (MAE) ie an average absolute error of error foresee (positive and negative values not seen) can be seen in equation 2.5

$$MAE = \frac{\sum |x_t - F_t|}{n} \quad (2.5)$$

2. ***Mean Absolute Deviation (MAD)***
   *Mean Absolute Deviation (MAD)*measuring forecast accuracy by averaging the alleged error (absolute value of each error). MAD useful when measuring forecast error in the same units as the original series. MAD value can be seen in equation 2.6.

$$MAD = \frac{\sum(Absolut\ dari\ Forecast\ Error)}{n} \quad (2.6)$$

3. ***Mean Squares Error (MSE)***
   Mean Squared Error (MSE) which is the average of the squared forecasting error and can be seen in equation 2.7.

$$MSE = \frac{\sum(X_t - F_t)}{n} \quad (2.7)$$

4. ***Mean Absolute Error***
   MAPE is a measure of the relative error. MAPE is usually more significant than MAD as stated percentage error MAPE forecasting results against the actual demand during certain periods that will provide information about the error percentage is too high or too low. Mathematically, MAPE can be seen in equation 2.8.

$$MAPE = \frac{100}{n} \sum |A_t \frac{F_t}{A}| \quad (2.8)$$

2.2 Analysis of the problem

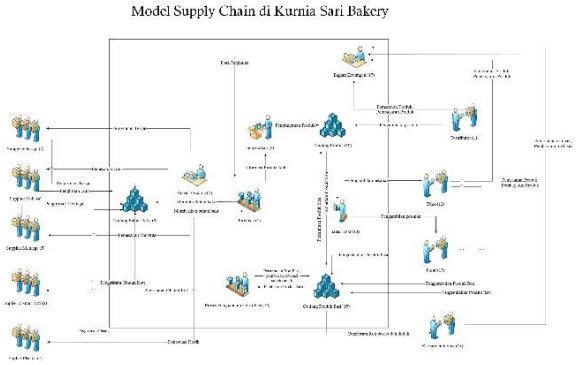
Analysis of the problem is the description of the problems derived from the current system is currently underway which will be described in these procedures on a data processing program Information Systems Supply Chain Management Approach in Kurnia Sari Bakery. The following analysis of the problems of the current system date:

1. Head of Warehouse difficulty in determining the amount of raw materials to be ordered to the supplier
2. Head of delivery difficulties in determining a vehicle that will be used and the schedule pengirimian to agents.

2.3 Analysis of Supply Chain Management at Kurnia Sari Bakery

Supply Chain strategy used is Push Supply Chain, As is the case today in the company strategy make-to-stock namely the production process prior to booking. Supply Push strategy used for large production processes (Mass Product) conducted by Kurnia Sari Bakery. Push Supply Chain strategy used for the purpose of how inventory can fulfill product orders by agents.

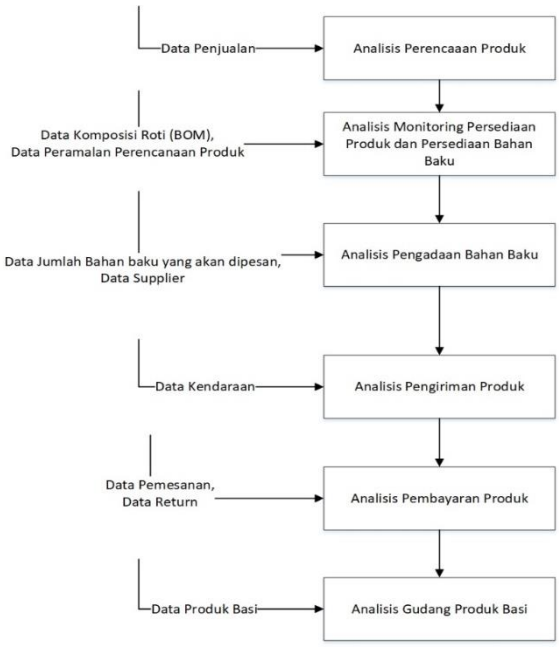
2.4 Model Supply Chain Management in Kurnia Sari Bakery



Picture 3, Model Supply Chain Management in Kurnia Sari Bakery

2.5 Analysis of Supply Chain Management Stages in Kurnia Sari Bakery

Analysis of supply chain management is used describe the process of supply chain management which will be built in Kurnia Sari Bakery based supply chain model in Figure 3. The following is an analysis of the stages of the supply chain in Kurnia Sari Bakery can be seen in Figure 4.



Picture 4. Stages Supply Chain Management in Kurnia Sari Bakery.

1. Analysis of Product Planning

Analysis of product planning is the stage at which to calculate the daily production planning so that the raw materials to be used to meet the needs of production planning that has been planned. Production planning is done is forecasting based on previous production data.

Forecasting technique used is quantitative technique because of the past needs are adequately met. Forecasting methods used in this research is the method Single Exponential Smoothing.

2. Inventory Monitoring Analysis Products and Raw Materials

After doing the forecasting stage, the next stage is to monitor the product inventory and raw material supply as well as determining the safe limit of products and raw materials that should exist in warehouse aimed to avoid shortages or emptiness products and raw materials using methods Safety Stock.

3. Raw Material Procurement Analysis

In the analysis of these raw procurement, raw material storage section make a reservation based on the submission of the raw material performed by the production department. The procurement process is done by means of cooperation have been agreed. When the raw materials that have been ordered to come will be handled by the Warehouse of raw materials. Raw material warehouse inspect the raw materials have to meet the standards of the company. If the goods come meet corporate standards then it will go into the warehouse inventory of raw materials

and if it does not comply will be returned to the supplier.

4. Analysis of Product Delivery

In the supply chain are the product delivery activities. Coverage in shipping activities include monitoring products are ready for shipment, delivery status monitoring, scheduling delivery and capacity of vehicles that will be used in the distribution of products to the customer. Monitoring the delivery is done so that the product reaches the customer at the right time and place, shipment status monitoring is performed to determine the delivery status of the product is up to the customer or are still in the process of delivery. Scheduling activities to deliveries made to the customer with a predetermined schedule, scheduling can be determined by looking at the distribution of orders which products are available and ready to be sent,

5. Payment Analysis Bakery Items

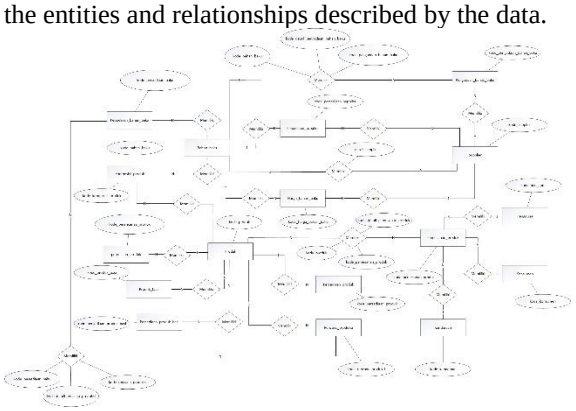
Analysis of product payments are payments made by agents distributors, shops and markets. Payments paid when bread bakery products have been sold and bread can be returned if the state of stale bread. Payment products Bread = (Booking Bread - Bread retutn) * the price of bread.

6. Analysis of Product Warehouse Basi

Warehouse Analysis stale product in Kurnia Sari Bakery is stale bakery products sold to farmers who have cooperated with Kurnia Sari Bakery.

2.6 Analysis Database

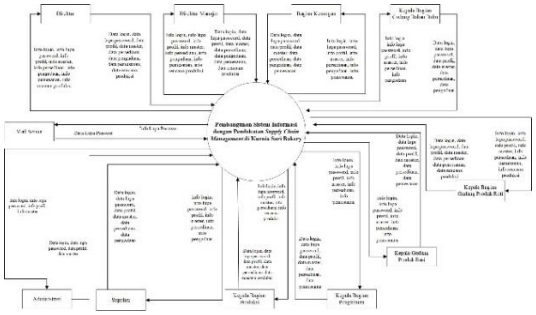
Analysis of the data on the basis of supply chain management information system in Kurnia Sari Bakery which will be built using Entity Relationship Diagram (ERD). ERD is a data model built using some notation to describe the data in the context of the entities and relationships described by the data.



Picture 5, Entity Relationship Diagram (ERD) Supply Chain Management Information System in Kurnia Sari Bakery

2.7 diagram Context

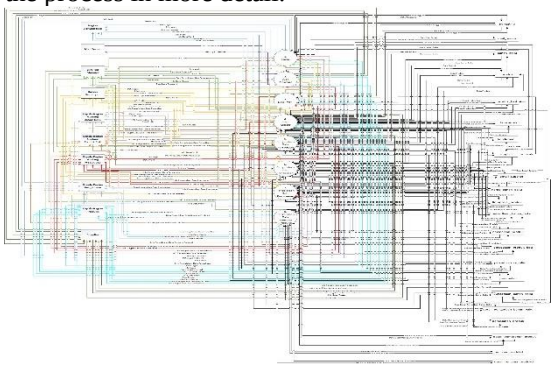
Diagram context is a global model to explain how the data are used and transformed to the process or describe the flow of data into and out of the system. The context of the system diagram shown in Figure 6.



Picture 6. Diagram Context of Supply Chain Management Information System in Kurnia Sari Bakery.

2.8 Data Flow Diagram (DFD)

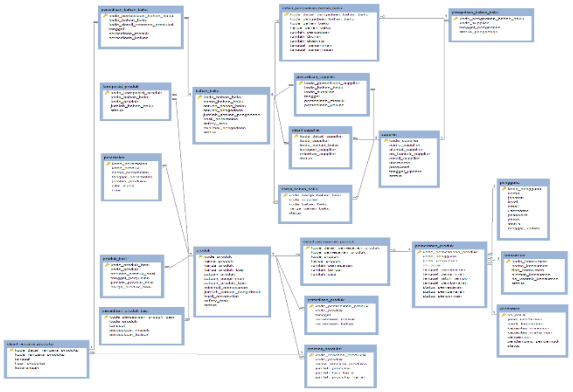
Data flow diagrams shows how data flows outlines the processes that occur in the system until the process in more detail.



Picture 7. Level 1 Information Systems with Supply Chain Management approach in Kurnia Sari Bakery.

2.9 Relation scheme

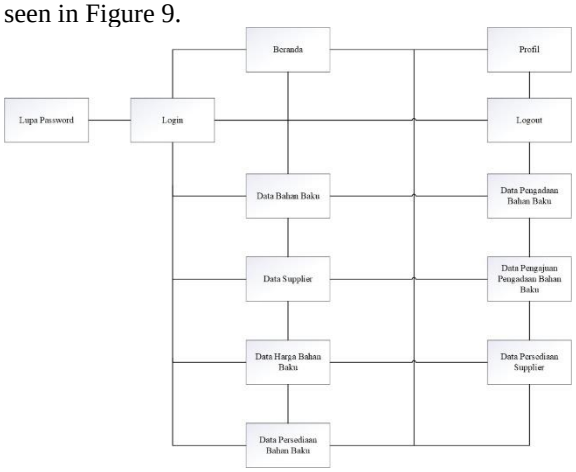
Relation schema describes the relationships among the data, meaning data and limits. The process of relations between attributes is a combination between the attributes that have the same primary key, so that these attributes into a single unit which is connected by the key fields.



Picture 8. Relation Scheme Information Systems with Supply Chain Management approach in Kurnia Sari Bakery.

2.10 Design Menu

The design of the menu structure is used to give an idea what the menu can be accessed on the system. The menu structure to be built consists of several menu structure. The design of the menu structure section chief raw material warehouse is designed menu structure in accordance with the level of section chief baku.Perancangan materials warehouse storage section chief menu structure of raw materials can be seen in Figure 9.

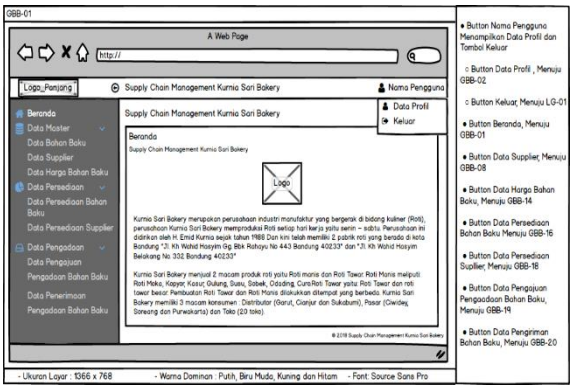


Picture 9. Menu Structure Head of Raw Material Warehouse.

2.11 designing Interfaces

The design of the interface is made to describe the rogram display that will be used by the user to interact with the system to be built. The design is based on the interface display both input and output to be generated when the application is implemented.

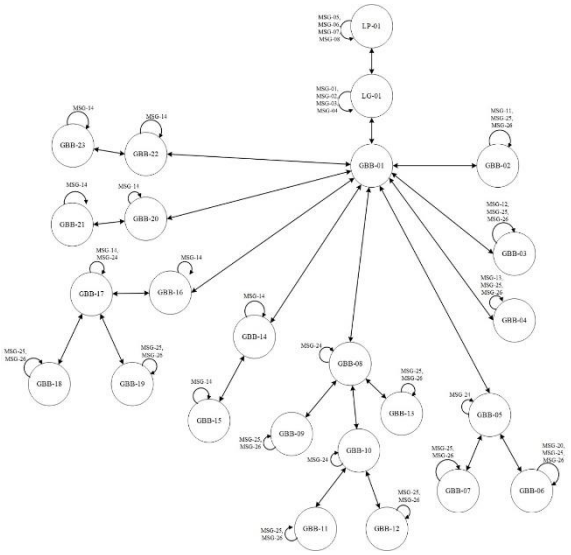
The design of the interface in the system information with supply chain management approach in Kurnia Sari Bakery.



Picture 10. Interface Head of Raw Material Warehouse.

2.12 Network Design Semantics

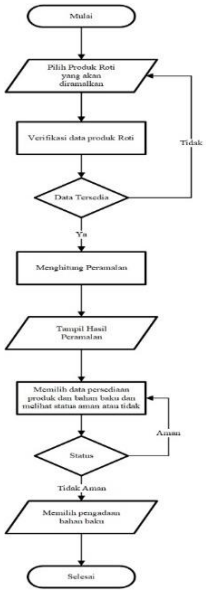
The design of the semantic network representation of the design interface that shows where each interface is connected. The design of semantic networks in information systems Kurnia Sari Bakery. Information systems development approach to supply chain management in Kurnia Sari Bakery can be seen in Figure 11.



Picture 11. Semantic Networks Head of Raw Material Warehouse.

2.13 Procedural Design

Perancangan procedural transform the structural elements of the architecture program into a procedural description of the components of the software. Here is a procedural procurement of raw materials in Kurnia Sari Bakery seen in Figure 12.



Picture 12. procedural Procurement

2.14 testing Systems

Testing of the system is the cornerstone that aims to find errors or omissions in the information systems that do diuji.Pengujian there are 3 kinds of black box testing, testing UAT (User Acceptance Testing) and end user testing (Interview).

1. Black Box Testing

Black box testing is a test used to test the new system. Black box testing focused on testing the functional requirements of information systems.

Based on test results with sample test cases that have been done to the conclusion that the process is correct. Filtering process in the form of referrals error message page is enough to see the maximum. Functionally, the system is able to produce the expected output.

2. End User Testing (User Acceptance Test)

The purpose of *user acceptance test*is to confirm that the system is in the testing can meet the business needs to provide assurance that the test system is working properly and can be used before it was officially to end users. End user testing performed by one or more representatives of the user with the help of a team of testers.

Based on end-user acceptance testing has been done with Managing Director of information systems with supply chain management approach in Kurnia Sari Bakery, it can be concluded that the system has been accepted by the user and can proceed to the next stage.

3. End User Testing (Interview)

This test, the software will be submitted to user to know whether the software meets the expectations of users and works as expected using interview techniques.

Interviews were conducted to the head of the warehouse of raw materials and parts delivery Kurnia Sari Bakery, the purpose of the interview is to be aware of the extent to which the system is built to be a solution and can petrify the existing problems in Kurnia Sari Bakery.

Based on end-user testing, it can be concluded that:

1. The system is built already, enables the head of the storage of raw materials and parts delivery.
2. The language used is easy to understand.
3. Interface is quite interesting.

3. CLOSING

In this section explains about the conclusions that contains the results obtained after the analysis, design, and implementation of the software design was built and has been developed as well as suggestions that will provide important records and possible improvements that need to be done to software development earlier ,

3.1 Conclusion

Based on the results obtained in this thesis, it can be concluded as follows:

1. Supply chain management information system that is built can facilitate the head of the warehouse of raw materials determines the amount of raw materials to be ordered for the production process.
2. Supply chain management information system that is built can facilitate the delivery section chief for the use of the vehicle and set up schedules to each agent.

3.2 Suggestion

Suggestions for the development of supply chain management information systems are some suggestions that can be done, among others:

1. Development of supply chain management information system is better if the making of analysis can plan sales targets on an annual basis or monthly.
2. Interface more attractive.

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